



Superfund

From: Cardarelli, John
Sent: Friday, April 19, 2013 10:06 AM
To: Curry, Tim
Cc: Thomas, Mark J.; Jefferson, Matthew; Gravatt, Dan; Stapleton, Jeff
Subject: RE: Questions on Flyover

0401

Tim, Jeff, and Dan

Here's my initial attempt to address these questions. I'm happy to expand / clarify if needed. My responses immediately follow the questions.

1. The Aspect radiation measurement system uses gamma ray spectrometry for determining radiation levels. This process evaluates gamma rays issued by radioactive elements (radionuclides) in the top surface of the ground and through sophisticated procedures translates these readings back to an "equivalent" Uranium and Thorium value as both of these elements emit little or no gamma radiation. Thorium 230 emits significant alpha radiation particles which are unable to be directly measured by the ASPECT system. This system assumes that the radioactive decay chain for Uranium and Thorium are in equilibrium (Secular Equilibrium) with predictable relationships with daughter products which have higher gamma radiation. In an Argonne National Laboratory report on Natural Decay Series it declares that the state of Secular Equilibrium in natural uranium and thorium ores is significantly altered when they are processed to extract specific radionuclides. Wouldn't this situation compromise the ability of the ASPECT aircraft to obtain the relatively lower levels of radiation associated with Uranium and Thorium distributed in the Coldwater Creek watershed by water flow and floods as opposed to the higher level radiation and more dense distribution of radionuclides previously determined to exist in the West Lake landfill?

This is an excellent question and conveys a very good understanding of the scientific and technical challenges airborne technologies present when conducting and interpreting environmental surveys, such as those conducted over Westland Landfill and Coldwater Creek. The issue of secular equilibrium mentioned in the question is true for the Westlake Landfill because we know that the waste residues (namely the uranium decay products) in the landfill have been artificially separated from the uranium through industrial processes. For this reason, our report specifically addressed this limitation and refer our results to radium rather than uranium. The ASPECT scientists have no information to suggest that the same industrial processes used to generate the Westlake Landfill waste were used to generate waste that remains or resides in the Coldwater Creek survey areas. Therefore, the assumption of secular equilibrium should apply with sufficient accuracy to predict naturally occurring concentrations for potassium, uranium, and thorium primordial elements within the Coldwater Creek survey area. The natural processes of water flow and floods in these areas would not separate the uranium or thorium from their decay products. That mainly occurs through man-made/industrial activities and may occur in nature due to specific geologic soil conditions which could preferentially separate the uranium and thorium parent nuclide from their respective decay chains. This natural separation process usually takes thousands, if not tens of thousands of years, to achieve a meaningful separation. The Coldwater Creek area is not known to have such geologic conditions to enhance this natural separation process and the airborne survey data show a natural distribution of primordial elements as expected. This can be further confirmed through soil sampling throughout the area.

2. What was the flight path spacing between flight paths used on the ASPECT aircraft Coldwater Creek flyover? This flight path spacing determines gaps on the ground that would not have any gamma ray readings. These gaps could have significant radioactive point sources that could be missed. Additionally, aerial measurements average readings in the area being scanned and would not pick up smaller areas of intense radioactivity.

Another excellent question. Regarding the line spacing, ASPECT scientists chose a very conservative flight line-spacing of 500 ft (shorter line spacings than normal) in an effort to minimize the concerns raised in this question. Flight line spacing is usually determined by the altitude. The general rule of thumb for line spacings is "twice the height"; therefore, a normal flight-line spacing of 1000 feet would have been adequate for an environmental survey over the

Coldwater Creek areas. This rule is based on the "field-of-view" of the detectors within the aircraft. They are like a camera with a lens that can see the radiation emanating from the ground with a width of about twice the height of the aircraft, hence the "twice the height" rule and the line spacing decisions. ASPECT flew line spacings of 500 ft (with a height of 500 ft) which provides a 100% overlap between the "field-of-view" of the detectors, thus reducing the likelihood of missing a significant point source. Finally, the ASPECT program looked at this question at another site and those results can be found at <http://www.epa.gov/region4/superfund/images/nplmedia/pdfs/coroiflrt2011.pdf>.

Additionally, the concern expressed about missing smaller areas of intense radioactivity is a valid concern. The ASPECT team shares this concern and has done research to better understand the "spatial averaging" limitations of the airborne technology so as to minimize the potential of missing an intense source or at least understanding and quantifying how intense a source could be missed (see the reference mentioned earlier). Spatial averaging is specifically discussed in the appendix of the report under the heading "Spatial Averaging Considerations." The ASPECT radiological detection system is state-of-the-art technology with excellent sensitivity to detect the most subtle changes in radiological signatures. Further, ASPECT processes data using multiple, independent, and scientifically valid methods - as described in the report. We use internationally recognized methods published by the IAEA, other methods employed by the DOE, and have developed more sensitive algorithms within our own program. The multiple approaches used by the ASPECT program help reduce the likelihood of missing an unacceptable "intense" radioactive source (sufficient to be a significant long-term health threat) from natural or man-made origins.

3. Soil moisture can reduce gamma ray counts. Was the soil moisture evaluated in interpreting the results of ASPECT?

The impact of soil moisture on gamma ray counts is discussed in the report. The potential impact of the recent snow melt in the area prior to the survey was evaluated in interpreting the results. There was no evidence to suggest that it had a significant impact that would affect the findings or conclusions.

-----Original Message-----

From: Curry, Tim
Sent: Friday, April 19, 2013 8:42 AM
To: Cardarelli, John
Cc: Thomas, Mark J.; Jefferson, Matthew; Gravatt, Dan
Subject: FW: Questions on Flyover

John,
Take a look at Matt's message. These are the kinds of questions that community action committees come up with. Matt is looking for some support in answering these. I know how busy you are so talking directly with Matt is going to be the best way to schedule any calls or responses.

-----Original Message-----

From: Jefferson, Matthew
Sent: Thursday, April 18, 2013 4:51 PM
To: Singletary, DeAndre; Curry, Tim; Washburn, Ben; Jordan-Izaguirr, Denise; Harman, Erin
Cc: Gravatt, Dan
Subject: Questions on Flyover

St Louis FUSRAP team,

Below are some ASPECT questions from Jenelle Wright, who is one of the Coldwater Creek community members. I was planning to call her back with Tim and/or another ASPECT expert to answer her questions and invite ATSDR, in case she had health related questions. I'm still trying to set this up with Jenelle, but I would like to have this call before the April 25 St Louis Oversight Committee Meeting:

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